CLAIMS

1. A system comprising a packaging machine, a zipper processing machine, and a zipper material that travels first through said zipper processing machine and then through said packaging machine, wherein:

said zipper material comprises a first zipper strip interlocked with a second zipper strip;

said packaging machine comprises a joining station whereat a respective portion of said first zipper strip is joined to a respective portion of a packaging material during each work cycle, and means for advancing said packaging material during each work cycle, each advance being equal in distance to *N* package lengths, where *N* is a positive integer greater than unity; and

said zipper processing machine comprises a slider insertion device and a zipper take-up device for accumulating some of said zipper material in a zone between said slider insertion device and said joining station.

2. The system as recited in claim 1, wherein said zipper take-up device comprises a linear accumulator.

3. The system as recited in claim 2, wherein said linear accumulator comprises a linear actuator and a roller that is displaceable between extended and retracted positions by said linear actuator, a portion of said zipper material being wrapped around a segment of a circumference of said roller.

4. The system as recited in claim 3, wherein said linear actuator comprises a ball screw.

5. The system as recited in claim 1, wherein said zipper take-up device comprises a rotary accumulator.

6. The system as recited in claim 5, wherein said rotary accumulator comprises a rotary actuator, a pivotable arm and a roller pivotably mounted to a distal end of said arm, said arm being pivotable between extended and retracted angular positions by said rotary actuator, a portion of said zipper material being wrapped around a segment of a circumference of said roller.

7. The system as recited in claim 1, further comprising a controller programmed to perform the following steps:

activating said joining station to join a respective portion of said zipper material to a respective portion of said packaging material during a first portion of each work cycle; and

activating said advancing means to advance said packaging material during a second portion of each work cycle.

8. The system as recited in claim 7, wherein said controller is further programmed to activate said zipper take-up device to extend in $(N - 1)$ discrete steps during said first portion of each work cycle and to retract during said second portion of each work cycle, one portion of said zipper material located in said zipper processing machine being advanced during each extension of said zipper take-up device, while another portion of said zipper material located in said packaging machine is not advancing.

9. The system as recited in claim 7, wherein said zipper processing machine further comprises a clamping device located downstream from said zipper take-up device.

10. The system as recited in claim 9, wherein said controller is further programmed to activate said clamping device and said zipper take-up device in sequence during said first portion of each work cycle, said zipper material being clamped to prevent zipper pullback during accumulation.

11. The system as recited in claim 1, wherein said zipper processing machine further comprises tension control means for maintaining a substantially constant tension of said zipper material in a zone from said slider insertion device to said joining station when zipper material in said zone is not advancing.

12. The system as recited in claim 8, wherein said zipper processing machine further comprises an ultrasonic horn arranged to deform a confronting portion of said zipper material when said horn is activated, wherein said controller is further programmed to activate said horn *N* times during said first portion of each work cycle.

13. The system as recited in claim 8, wherein said controller is further programmed to activate said slider insertion device *N* times during said first portion of each work cycle.

14. The system as recited in claim 1, wherein said packaging machine further comprises *N* thermoforming dies for thermoforming respective sections of said packaging material into respective pockets during said second portion of each work cycle, said thermoforming dies being arranged in sequence and located upstream of said joining station.

15. A system comprising a packaging machine, a zipper processing machine, and a zipper material that travels first through said zipper processing machine and then through said packaging machine, wherein:

said zipper material comprises a first zipper strip interlocked with a second zipper strip;

said packaging machine comprises a joining station whereat a respective portion of said first zipper strip is joined to a respective portion of a packaging material during each work cycle, and means for advancing said packaging material during each work cycle, each advance being equal in distance to *N* package lengths, where *N* is a positive integer greater than unity;

and

said zipper processing machine comprises a zipper deforming device for fusing and shaping said first and second zipper strips, and a zipper take-up device for accumulating some of said zipper material in a zone between said zipper deforming device and said joining station.

16. The system as recited in claim 15, further comprising a controller programmed to perform the following steps:

activating said joining station to join a respective portion of said zipper material to a respective portion of said packaging material during a first portion of each work cycle; and

activating said advancing means to advance said packaging material during a second portion of each work cycle.

17. The system as recited in claim 16, wherein said controller is further programmed to activate said zipper take-up device to extend in $(N - 1)$ discrete steps during said first portion of each work cycle and to retract during said second portion of each work cycle, one portion of said zipper material located in said zipper processing machine being advanced during each extension of said zipper take-up device, while another portion of said zipper material located in said packaging machine is not advancing.

18. The system as recited in claim 17, wherein said controller is further programmed to activate said zipper deforming device N times during said first portion of each work cycle.

19. The system as recited in claim 18, wherein said zipper deforming device comprises an ultrasonic horn.

20. The system as recited in claim 15, wherein said zipper take-up device comprises a linear accumulator.

21. The system as recited in claim 15, wherein said zipper take-up device comprises a rotary accumulator.

22. A method of manufacture comprising the following steps:

intermittently advancing a packaging material along a process pathway that passes through a joining station during a first portion of each work cycle, each advance of said packaging material being equal in distance to *N* package lengths, where *N* is a positive integer greater than unity, said packaging material not advancing during a second portion of each work cycle;

joining a respective portion of a zipper material to a respective portion of said packaging material at said joining station during said second portion of each work cycle; and

inserting, in succession, *N* sliders at regular spaced intervals on said zipper material during said second portion of each work cycle, slider insertion being performed at a slider insertion station located upstream of said joining station.

23. The method as recited in claim 22, further comprising the step of accumulating zipper material in a zone between the slider insertion station and said joining station, said accumulating step being performed (*N* - 1) times during said second portion of each work cycle.

24. The method as recited in claim 23, wherein said zipper accumulating step comprises linearly displacing an effector from a retracted position to an extended position.

25. The method as recited in claim 23, wherein said zipper accumulating step comprises displacing an effector along an arc from an retracted angular position to an extended angular position.

26. The method as recited in claim 23, further comprising the step of thermoforming respective sections of said packaging material to form a set of

N pockets upstream of said joining station during said second portion of each work cycle.

27. The method as recited in claim 23, wherein said zipper material comprises a first zipper strip interlocked with a second zipper strip, further comprising the step of fusing and shaping said first and second zipper strips at regular spaced intervals on said zipper material, said fusing and sealing step being performed *N* times during said second portion of each work cycle.

28. The method as recited in claim 24, further comprising the step of clamping a portion of said zipper material at a location upstream from the accumulated portion of said zipper material, said clamping step being performed prior to a first accumulating step during said second portion of each work cycle to prevent zipper pullback during accumulation

29. A method of manufacture comprising the following steps:

intermittently advancing a packaging material along a process pathway that passes through a joining station during a first portion of each work cycle, each advance of said packaging material being equal in distance to *N* package lengths, where *N* is a positive integer greater than unity, said packaging material not advancing during a second portion of each work cycle;

fusing and shaping, in succession, respective zones of said mutually interlocked first and second zipper strips at regular spaced intervals along their length, said fusing and shaping step being performed *N* times during said second portion of each work cycle, the result being one fused shape per package-length section of said interlocked first and second zipper strips; and

joining a respective portion of said first zipper strip to a respective portion of said packaging material at said joining station during said second portion of each work cycle.

30. The method as recited in claim 29, further comprising the step of accumulating said first and second zipper strips in a zone between the slider insertion station and said joining station, said accumulating step being performed (N - 1) times during said second portion of each work cycle.

31. The method as recited in claim 30, further comprising the step of thermoforming respective sections of said packaging material to form a set of N pockets upstream of said joining station during said second portion of each work cycle.

32. A system comprising:

means for intermittently advancing a first elongated continuous structure made of flexible material along a process pathway during a first portion of each work cycle, each advance of said first elongated continuous structure being equal in distance to N unit lengths, where N is a positive integer greater than unity, said first elongated continuous structure not advancing during a second portion of each work cycle;

means for forming N structural features concurrently in a portion of said first elongated continuous structure having a length equal to N unit lengths during said second portion of each work cycle, one structural feature per unit length of said first elongated continuous structure;

means for joining respective portions of a second elongated continuous structure made of flexible material to respective portions of said first elongated continuous structure during said second portion of each work cycle;

means for inserting, in succession, N articles at regular spaced intervals on said second elongated continuous structure during said second portion of each work cycle, one article per unit length of said second elongated continuous structure, the articles being inserted at a location upstream of the location where said first and second elongated continuous structures are joined; and

means for accumulating portions of said second elongated continuous structure carrying said articles in a zone between the article insertion location and the location where said first and second elongated continuous structures are joined, accumulation occurring in (*N* - 1) discrete stages during said second portion of each work cycle and not occurring during said first portion of each work cycle.

33. The system as recited in claim 32, wherein said first elongated continuous structure comprises a web of packaging film, said second elongated continuous structure comprises first and second zipper strips that are interlocked with each other, each of said structural features is a respective pocket formed in said packaging film, each of said articles is a respective slider inserted on said interlocked first and second zipper strips, and one unit length equals one package length

34. A system comprising:

means for intermittently advancing a first elongated continuous structure made of flexible material along a process pathway during a first portion of each work cycle, each advance of said first elongated continuous structure being equal in distance to *N* unit lengths, where *N* is a positive integer greater than unity, said first elongated continuous structure not advancing during a second portion of each work cycle;

means for forming *N* structural features concurrently in a portion of said first elongated continuous structure having a length equal to *N* unit lengths during said second portion of each work cycle, one structural feature per unit length of said first elongated continuous structure;

means for joining respective portions of a second elongated continuous structure made of flexible material to respective portions of said first elongated continuous structure during said second portion of each work cycle;

means for forming, in succession, *N* structural features of a second type at regular spaced intervals on said second elongated continuous structure during said second portion of each work cycle, one structural feature of said second type per unit length of said second elongated continuous structure, structural features of said second type being formed at a location upstream of the location where said first and second elongated continuous structures are joined; and

means for accumulating portions of said second elongated continuous structure having structural features of said second type in a zone between the location where structural features of said second type are formed and the location where said first and second elongated continuous structures are joined, accumulation occurring in (*N* - 1) discrete stages during said second portion of each work cycle and not occurring during said first portion of each work cycle.

35. The system as recited in claim 34, wherein said first elongated continuous structure comprises a web of packaging film, said second elongated continuous structure comprises first and second zipper strips that are interlocked with each other, each of said structural features of said first type is a respective pocket, each of said structural features of said second type is a respective zone where said interlocked first and second zipper strips are fused together, and one unit length equals one package length.

36. The system as recited in claim 35, further comprising means for inserting, in succession, *N* sliders at regular spaced intervals on said first and second zipper strips during said second portion of each work cycle, one slider per unit length of said first and second zipper strips, the sliders being inserted at a location upstream of said accumulating means.

37. A method of manufacture comprising the following steps:

joining respective portions of a first elongated continuous structure made of flexible material with attached articles and/or formed features

of a first type to respective portions of a second elongated continuous structure made of flexible material that has formed features of a second type during a first portion of each work cycle;

advancing said second elongated continuous structure and the portions of said first elongated continuous structure joined thereto during a second portion of each work cycle by a distance equal to *N* unit lengths per advance, where *N* is a positive integer greater than unity;

accumulating portions of said first elongated continuous structure with attached articles and/or formed features but not yet joined to said second elongated continuous structure, said accumulation occurring in $(N - 1)$ discrete stages while the second elongated continuous structure is stationary during each work cycle; and

undoing each accumulation during each advancement of said second elongated continuous structure.

38. The method as recited in claim 37, wherein said first elongated continuous structure comprises first and second zipper strips that are interlocked with each other, said second elongated continuous structure comprises a web of packaging film, each formed feature of said first type is a respective zone of fusion on said interlocked first and second zipper strips, each formed feature of said second type is a respective pocket formed in said packaging film, each article is a respective slider inserted on said interlocked first and second zipper strips, and one unit length equals one package length.

39. The method as recited in claim 37, further comprising the steps, performed during each dwell time, of:

tensioning a portion of said first elongated continuous structure disposed upstream of the most recently joined portion; and

inserting a respective article on said tensioned portion of said first elongated continuous structure, said articles being spaced at regular intervals, one article per unit length.

40. The method as recited in claim 1, further comprising the steps, performed during each dwell time, of:

tensioning a portion of said first elongated continuous structure disposed upstream of the most recently joined portion; and

forming a respective structural feature of said first type on said tensioned portion of said first elongated continuous structure, said structural features of said second type being spaced at regular intervals, one structural feature of said second type per unit length.